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(54) Improvements relating to wrap spring clutches

(57) A wrap spring clutch enables drive to be made between a central drive shaft (1) and a drive member (2) carrying a sprocket (3). The drive member (2) is interconnected with a drum (4) through a helical clutch spring (5), a portion of the spring (5) being disposed loosely around a collar (10) which is integral with the shaft (1). The drum (4) is formed from a ferromagnetic material so that when an electromagnetic coil (8) is energised, the drum (4) will slow down causing the spring (5) to grip the collar (10) and thus connect drive through from the drive shaft (1) to the sprocket (3). Such a device is liable to fail if gaps are allowed to appear at positions (16 and 17) between relative moving parts. The parts are therefore kept in close contact by a spring loaded washer (11) carried by the drive shaft (1) and acting via a wear bearing (12).

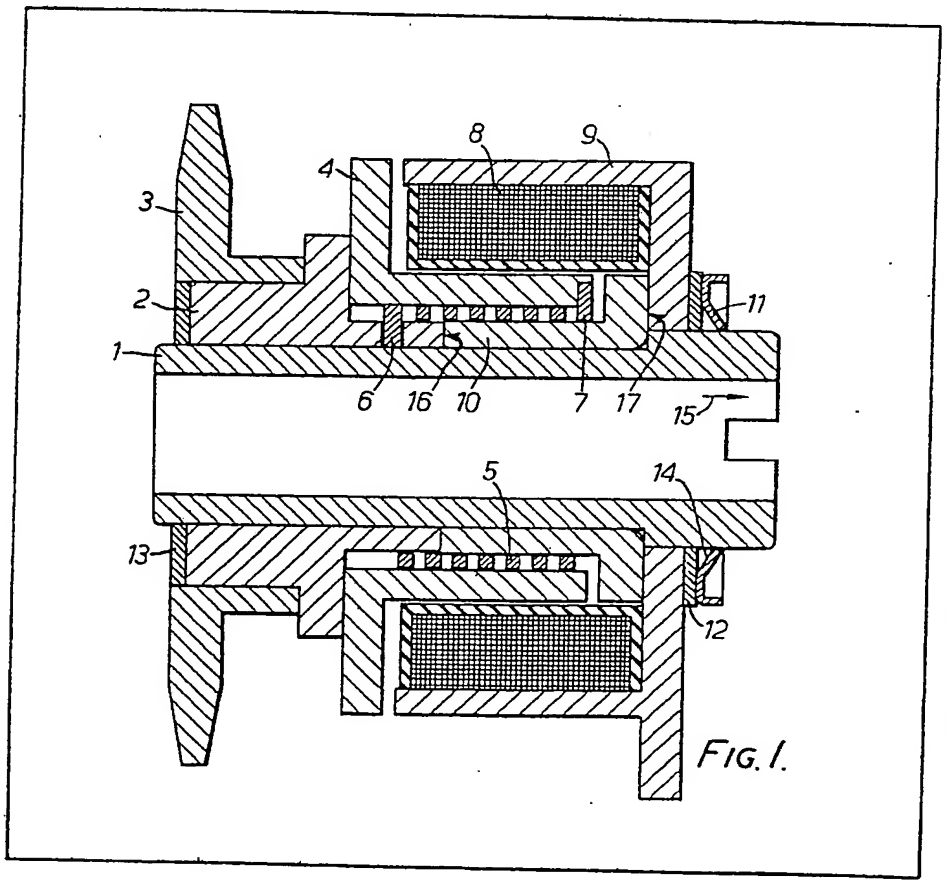

FIG. 1.

The drawing originally filed was informal and the print here reproduced is taken from a later filed formal copy.

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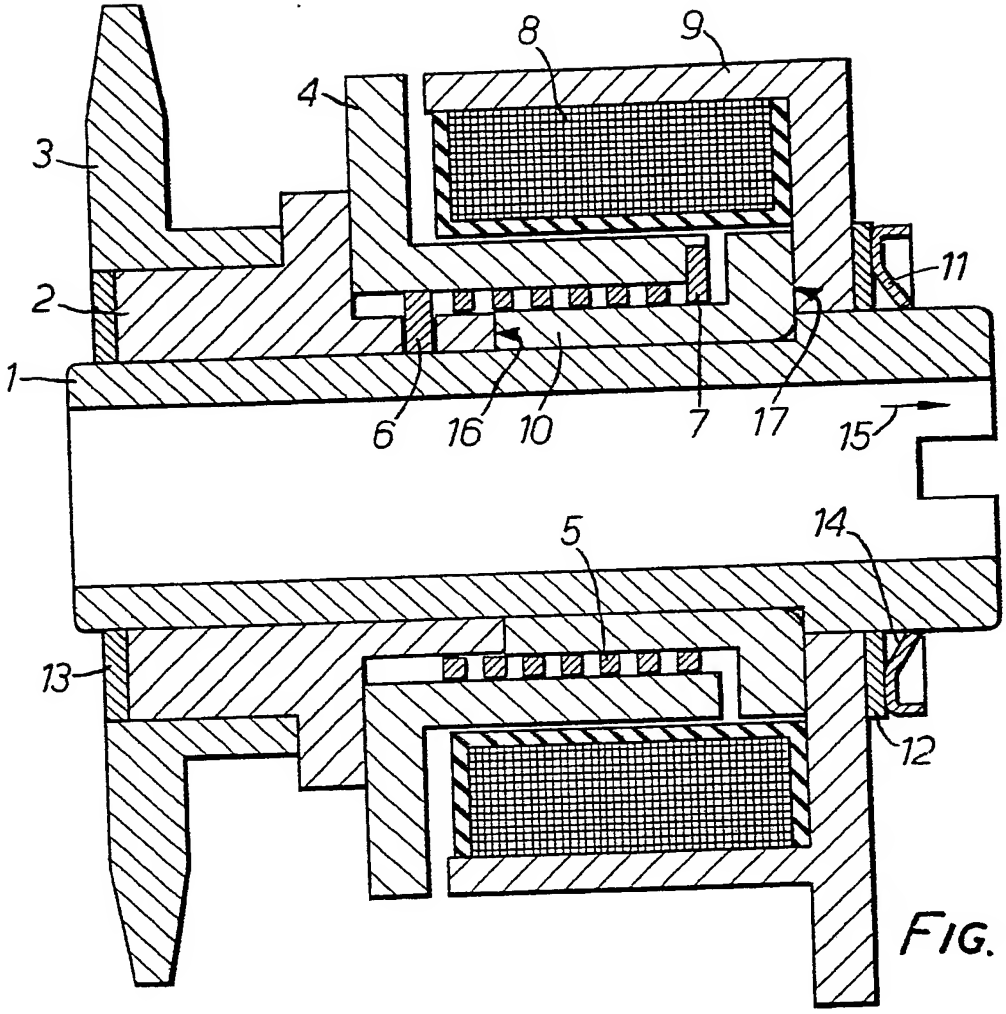

FIG. 1.

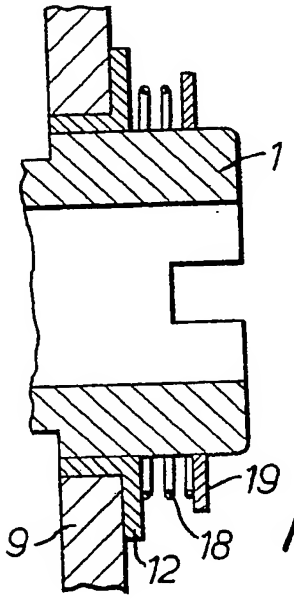

FIG. 2.

SPECIFICATION

Improvements relating to wrap spring clutches

This invention is concerned with the type of clutch wherein drive is transmitted between two co-axial members by causing a helical clutch spring carried by one of the members to be tightened so as to grip the other of the two members.

Various problems are met with such clutches due to wear since gap tolerances between the various parts of the clutch are very critical and eventually wear occurring between these parts can cause catastrophic failure. The various parts of the clutch are held together about a central drive shaft by means of a circlip and this circlip (and parts in direct contact therewith) is also subject to wear during use. As wear becomes noticeable the speed with which further wear occurs increases. The effects of wear are various and include the problem that canting of the central shaft of the clutch with respect to the outer parts distorts the clutch spring and affects its stiffness. Substantial wear can affect the speed of operation of the clutch and can eventually create a gap between moving parts which is so large that a portion of the spring can jam within the gap.

It is an object of this invention to provide a wrap spring clutch which alleviates the problems existing in conventional clutches.

Accordingly this invention provides a wrap spring clutch comprising a central drive shaft, a drive member which is carried by and freely rotatable with respect to the drive shaft, a drum disposed about the drive shaft, a helical clutch spring linking the drive member to the drum, a portion of the spring being disposed loosely around a portion of the drive shaft, speed reducing means to act on the drum to cause reduction in the speed of movement thereof relative to the speed of rotation of the drive member, during operation, so as to cause the clutch spring to move into contact with the drive shaft, a spring loaded washer carried by the drive shaft and a wear bearing against which the spring loaded washer acts to cause axial slack between parts disposed around the drive shaft to be taken up.

The use of a spring loaded washer takes up any tolerances in the assembly so that the clutch will operate correctly for a much longer period of time than with conventional assemblies and the progressive wearing effect is substantially reduced in comparison. Any initial wear will tend to be taken up by the resilience of the spring loaded washer.

In the preferred embodiment the spring loaded washer has resilient tangs bent out of the plane of the washer and gripping the drive shaft. As an alternative, however, the spring loaded washer could comprise a coil spring surrounding the drive shaft and held in place by a circlip, lock nut or the like. Whilst the drive shaft could carry a fixed stop against which the outer parts of the clutch are held by the spring loaded washer it is preferred to provide that a spring loaded washer acts via a wear bearing at both ends of the assembly of parts surrounding the drive shaft.

The wear bearing is ideally a washer of synthetic material such as nylon or polytetrafluorethylene and this washer could advantageously be embedded in part of the clutch. As an alternative the spring loaded washer could be embedded in a synthetic bearing material which thus forms the wear bearing.

The speed reducing means may comprise an electromagnetic coil disposed around the drum, the drum being formed from ferromagnetic material, but any other convenient means for reducing the speed of the drum relative to the drive member may be employed.

Preferably the drive shaft carries a sintered bronze collar which is integrally secured thereto and comprises the portion of the drive shaft around which the clutch is disposed.

The invention may be performed in various ways and preferred embodiments thereof will now be described with reference to the accompanying drawings, in which:—

Figure 1 shows a wrap spring clutch constructed in accordance with this invention; and

Figure 2 illustrates a modification of a spring loaded washer carried by the shaft of the clutch.

The clutch shown in the drawing comprises a central drive shaft 1 about which are mounted the other parts of the clutch, including a drive member 2 (provided with a drive sprocket 3), which is freely rotatable about the drive shaft 1. The drive member 2 is linked to a magnetisable drum 4 by means of a helical clutch spring 5 having tags 6 and 7 at either end which are held respectively within openings in the drive member 2 and the drum 4. Thus if the drive member 2 is driven so that it rotates it will tend to carry the magnetic drum round with it via the interconnection through the spring 5. Disposed around the drum 4 is an electromagnetic coil 8 attached to a fixed outer shell 9. When the coil 8 is energised it attracts the drum 4 (which is formed from a ferromagnetic material) so that the speed of the drum 4 is reduced relative to the speed of the drive member 2 causing the spring 5 to tighten and grip onto a sintered bronze sleeve 10 which is integrally secured to the drive shaft 1. By this means the sleeve 10 becomes effectively locked to the drum 4 by means of the spring 5 gripping the outer surface of the sleeve 10 and thus a drive connection is made between the drive member 2 and the drive shaft 1. Upon de-energisation of the coil 8 the coil spring 5 reverts to its normal attitude and the drive interconnection between the drive member 2 and the drive shaft 1 is broken.

The parts of the clutch surrounding the drive shaft 1 are held together axially by means of a spring loaded washer 11 which grips the drive shaft 1 and bears against the shell 9 via a nylon washer 12. A similar spring loaded washer and bearing washer may additionally be mounted on the shaft 1 instead of the fixed boss or circlip 13 shown which provides the necessary stop at this position for the parts of the clutch. The spring

loaded washer 11 carries resilient tangs 14 bent out of the normal plane of the washer, which tangs, when the washer 11 is forced onto the shaft 1, grip the shaft and bias the shaft in the direction of the arrow 15 thus ensuring that gaps at the positions 16 and 17 are closed. Thus the possibility of canting of the shaft 1 with respect to the outer shell 9 in particular is substantially reduced and the closing of a possible gap at the point 16 ensures that the spring 5 cannot become jammed between the parts 2 and 10. When the drive member 2 is coupled to the drive shaft 1 the spring loaded washer 11 will rotate relative to the outer shell 9 via the bearing washer 12 and any wear on the bearing washer 12 or at the positions 16 and 17 will tend to be taken up by the resilience of the tangs 14. If this wear becomes significant then the spring loaded washer 11 can be pushed further onto the shaft 1 to take up the wear which has occurred.

It will be appreciated that any form of spring loaded washer which will cause tolerances between the various parts carried about the shaft 1 to be closed will suffice to alleviate the problems of wear. Thus, as shown in Figure, 2 the spring loaded washer could take the form of a coil spring 18 surrounding the shaft 1 and held in place by a lock nut or circlip 19 so as to bear on the bearing washer 12. Furthermore the features of the two washers 11 and 12 could be combined by embedding the spring loaded washer 11 in nylon or some other bearing material.

Of course the clutch could be operated by driving the drive shaft 1 and taking an output from the drive member 2 when the clutch is operated.

As shown in Figure 2 the washer 12 can extend inwardly to provide an additional bearing surface against the fixed shell 9.

CLAIMS

1. A wrap spring clutch comprising a central drive shaft, a drive member which is carried by and freely rotatable with respect to the drive shft, a drum disposed about the drive shaft, a helical clutch spring linking the drive member to the drum, a portion of the spring being disposed loosely around a portion of the drive shaft, speed reducing means to act on the drum to cause reduction in the speed of movement thereof relative to the speed of rotation of the drive member, during operation, so as to cause the clutch spring to move into contact with the drive shaft, a spring loaded washer carried by the drive shaft and a wear bearing against which the spring loaded washer acts to cause axial slack between parts disposed around the drive shaft to be taken up.

2. A clutch according to claim 1, wherein the spring loaded washer has resilient tangs bent out of the plane of the washer and gripping the drive shaft.

3. A clutch according to claim 1, wherein the spring loaded washer comprises a coil spring surrounding the drive shaft and a circlip, lock nut or the like holding the coil spring in place.

4. A clutch according to any one of claims 1 to 3, wherein a spring loaded washer acts via a wear bearing at both ends of the assembly of parts surrounding the drive shaft.

5. A clutch according to any one of claims 1 to 4, wherein the wear bearing is a washer of synthetic material such as nylon or polytetrafluorethylene.

6. A clutch according to claim 5, wherein the washer is embedded in a part of the clutch.

7. A clutch according to any one of claims 1 to 4, wherein the spring loaded washer is embedded in a synthetic bearing material which thus forms the wear bearing.

8. A clutch according to any one of claims 1 to 7, wherein the speed reducing means comprises an electromagnetic coil disposed around the drum, the drum being formed from ferromagnetic material.

9. A clutch according to any one of claims 1 to 8, wherein the drive shaft carries a sintered bronze collar which is integrally secured thereto and comprises the portion of the drive shaft around which the clutch spring is disposed.

10. A wrap spring clutch substantially as herein described with reference to the accompanying drawings.

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